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# Claims

[c1] 1.A downhole fluid pump, comprising:
a pump chamber; and
a piston disposed in the pump chamber so that the piston will move in one selected from a charge stroke and a discharge stroke when the piston is exposed to a pressure differential.

[c2] 2.The downhole fluid pump of claim 1, wherein the piston moves in the discharge stroke when exposed to a higher pressure.

[c3] 3.The downhole fluid pump of claim 2, wherein the higher pressure is an internal pipe pressure.

[c4] 4.The downhole fluid pump of claim 1, further comprising:
a second piston disposed in a second pump chamber; and
a connecting rod coupled to the piston and the second piston.

[c5] 5.A downhole fluid pump, comprising:
a pump chamber;
a hydraulic chamber;

a piston assembly having a first piston disposed in the pump chamber and defining a first section of the pump chamber and a second section of the pump chamber, the piston assembly also having a second piston disposed in the hydraulic chamber and defining a first section of the hydraulic chamber and a second section of the hydraulic chamber, the first piston and the second piston connected by a connecting member;

a valve in fluid communication with the pump chamber for selectively placing the pump chamber in fluid communication with at least one selected from a charge line and a discharge line;

an internal pipe pressure isolation valve for selectively hydraulically coupling the hydraulic chamber to an internal pipe pressure;

an annular pressure isolation valve for selectively hydraulically coupling the hydraulic chamber to an annular pressure; and

a spring disposed in one of the first section of the hydraulic chamber and the second section of the hydraulic chamber and positioned to exert a force on the piston assembly,

wherein the piston assembly is moveable with respect to the pump chamber and the hydraulic chamber.

[c6] 6.The downhole fluid pump of claim 5, further compris-

ing:

a bellows chamber; and

a flexible bellows disposed in the bellows chamber and defining a first bellows chamber section and a second bellows chamber section,

wherein the first bellows chamber section is in fluid communication with the second section of the hydraulic chamber, and the second bellows chamber section is in fluid communication with the annular pressure isolation valve and with the internal pipe pressure isolation valve.

[c7] 7.The downhole pump of claim 5, wherein an effective surface area of the first piston is different from an effective surface area of the second piston.

[c8] 8.The downhole pump of claim 7, wherein the effective surface area of the second piston is larger than the effective surface area of the first piston.

[c9] 9.The downhole pump of claim 5, wherein the spring is disposed in the first section of the hydraulic chamber and configured to push the piston assembly in a charge direction.

[c10] 10.The downhole pump of claim 5, further comprising at least one sensor.

[c11] 11.The downhole fluid pump of claim 10, wherein the at

least one sensor comprises a pressure sensor and a temperature sensor.

[c12] 12.The downhole fluid pump of claim 10, wherein the at least one sensor comprises a fluid monitoring sensor.

[c13] 13.The downhole fluid pump of claim 12, wherein the fluid monitoring sensor comprises an optical sensor.

[c14] 14.The downhole fluid pump of claim 5, further comprising a bubble-point detector.

[c15] 15.The downhole fluid pump of claim 14, wherein the bubble-point detector is an ultrasonic emitter/detector.

[c16] 16.The downhole fluid pump of claim 14, wherein the bubble-point detector is disposed proximate the first section of the pump chamber.

[c17] 17.A method of operating a fluid pump, comprising:
operating the fluid pump in one selected from the group consisting of a charge stroke and a discharge stroke by applying a lower pressure to a first side of a piston;
operating the fluid pump in the other of the charge stroke and the discharge stroke by applying a higher pressure to the first side of the piston; and
selectively repeating the applying the lower pressure to the first side of the piston and the applying the higher

pipe pressure to the first side of the piston.

[c18] 18.The method of claim 17, wherein the lower pressure is an annular pressure and the higher pressure is an internal pipe pressure.

[c19] 19.The method of claim 18, wherein the applying the annular pressure to the first side of the piston operates the fluid pump in the charge stroke, and the applying the internal pipe pressure to the first side of the piston operates the fluid pump in the discharge stroke.

[c20] 20.The method of claim 18, further comprising:
directing pumped formation fluid from the fluid pump into a borehole annulus;
monitoring the pumped formation fluid to determine when the pumped formation fluid is substantially cleaned up; and
once the pumped formation fluid has substantially cleaned up, directing the pumped formation fluid from the fluid pump into a sample chamber.

[c21] 21.The method of claim 20, further comprising:
monitoring movement of the piston;
calculating a total pumped volume to clean up based on the movement of the piston; and
determining a depth of invasion based on the total

pumped volume to clean up.

[c22] 22.The method of claim 18, further comprising measuring a formation fluid pressure.

[c23] 23.The method of claim 18, wherein the fluid pump is coupled to a first probe that is in fluid communication with a formation and further comprising measuring pressure pulses at a second probe that is in fluid communication with the formation.

[c24] 24.The method of claim 18, further comprising:
detecting a bubble in a formation fluid being pumped by the fluid pump; and
slowing a pumping speed of the fluid pump.

[c25] 25.A formation evaluation while drilling tool, comprising:
a drill collar;
a fluid inlet disposed in the drill collar; and
a fluid pump in fluid communication with the fluid inlet, wherein the fluid pump comprises
a pump chamber; and
a first piston disposed in the pump chamber so that the piston will move in one selected from a charge stroke and a discharge stroke when the piston is exposed to an internal pipe pressure.

[c26] 26.The formation evaluation while drilling tool of claim

25, wherein the first piston defines a first section and a second section of the pump chamber, the pump further comprising:

a hydraulic chamber;

a second piston disposed in the hydraulic chamber and defining a first section of the hydraulic chamber and a second section of the hydraulic chamber, the first piston and the second piston connected by a connecting member;

a valve in fluid communication with the pump chamber for selectively placing the pump chamber in fluid communication with at least one selected from a charge line and a discharge line;

an internal pipe pressure isolation valve for selectively hydraulically coupling the hydraulic chamber to an internal pipe pressure;

an annular pressure isolation valve for selectively hydraulically coupling the hydraulic chamber to an annular pressure; and

a spring disposed in one of the first section of the hydraulic chamber and the second section of the hydraulic chamber and positioned to exert a force on the second piston,

wherein the first piston is moveable with respect to the pump chamber and the second piston is moveable with respect to the hydraulic chamber.

[c27] 27.The formation evaluation while drilling tool of claim 25, wherein the fluid pump further comprises:
a bellows chamber; and
a flexible bellows disposed in the bellows chamber and defining a first bellows chamber section and a second bellows chamber section,
wherein the first bellows chamber section is in fluid communication with the second section of the hydraulic chamber, and the second bellows chamber section is in fluid communication with the annular pressure isolation valve and with the internal pipe pressure isolation valve.

[c28] 28.The formation evaluation while drilling tool of claim 25, wherein the fluid inlet comprises a probe that is extendable from the drill collar to be in fluid communication with a formation.

[c29] 29.The formation evaluation while drilling tool of claim 25, further comprising a first packer disposed above the fluid inlet and a second packer disposed below the fluid inlet.

[c30] 30.The formation evaluation while drilling tool of claim 25, further comprising an exit port and at least one sample chamber.

[c31] 31.The formation evaluation while drilling tool of claim

25, further comprising at least one sensor.

[c32] 32.The formation evaluation while drilling tool of claim 31, wherein the at least one sensor comprises one selected from the group consisting of a temperature sensor, a resistivity sensor, a pressure sensor, an optical sensor, and combinations thereof.

[c33] 33.A method of formation evaluation, comprising:
establishing fluid communication between a fluid inlet in a formation evaluation tool and a formation; and
drawing fluid into the tool by selectively repeating applying an annular pressure to a first side of a piston and applying an internal pipe pressure to the first side of the piston.

[c34] 34.The method of claim 33, wherein the establishing fluid communication comprises inflating packers to isolate a zone of interest on a borehole wall.

[c35] 35.The method of claim 33, wherein the establishing fluid communication comprises extending a probe to be in fluid communication with the formation.

[c36] 36.The method of claim 33, further comprising:
directing a sample fluid from the fluid pump into a borehole annulus;
determining when the sample fluid has cleaned up; and

directing the sample fluid into a sample chamber.

[c37] 37.The method of claim 33, further comprising measuring a pressure transient at the fluid inlet.

[c38] 38.The method of claim 33, further comprising measuring a pressure pulse at a second fluid inlet.

[c39] 39.The method of claim 33, further comprising measuring at least one formation fluid property.

[c40] 40.The method of claim 39, wherein the at least one formation fluid property is at least one selected from the group consisting of density, resistivity, and pressure.

[c41] 41.The method of claim 33, further comprising:
transmitting a start signal to the fluid pump;
stopping a drilling process;
stopping a flow of mud through a drill string; and
restarting the flow of mud through the drill string after a selected interval.

[c42] 42.The method of claim 33, further comprising:
monitoring movement of the piston;
calculating a total pumped volume to clean up based on the movement of the piston; and
determining a depth of invasion based on the total pumped volume to clean up.